

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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## (54) IMPROVEMENTS IN OR RELATING TO ROTATING ELECTRIC MACHINES LIQUID COOLED STATOR WINDINGS

(71) We, SKODA, NARODNI  
 PODNIK, a Czechoslovakian Body Corporate,  
 of Plzen, Czechoslovakia, do hereby declare  
 the invention, for which we pray that a patent  
 may be granted to us, and the method by  
 which it is to be performed, to be particularly  
 described in and by the following state-  
 ment:—

The invention relates to rotating electrical  
 machine stator windings, composed of insu-  
 lated bars formed from single conductors some  
 of which are hollow and provided with direct  
 internal liquid cooling.

According to the invention, the ends of a  
 pair of bars of such a winding are electrically  
 and hydraulically inter-connected by a fitting  
 manufactured from a seamless thickwalled  
 tube of circular cross-section of good electric-  
 ally conductive material, which fitting com-  
 prises two sleeves and a U-shaped elbow  
 having substantially parallel cylindrical ends,  
 which cylindrical ends are for a part of their  
 length slid into said sleeves with a clearance  
 required for brazing and are brazed liquid-  
 tightly within said sleeves, the free ends of  
 said sleeves being shaped in accordance with  
 the bar ends received therein and dimensioned  
 to accommodate said bar ends with a clear-  
 ance required for brazing.

Preferably the material of which the sleeves  
 and the elbow are manufactured is electrolytic  
 copper.

Some of the U-shaped elbows may be fitted,  
 on the outer bend thereof, with a screw joint  
 for the admission or discharge of the cooling  
 liquid.

Assembly of the fitting on a winding em-  
 bodying the invention is much facilitated by  
 the parallel arrangement of the elbow ends  
 since discrepancies in the spacing of the bar  
 ends of the winding of which the fitting former  
 part can be compensated by displacing the  
 elbow either angularly or parallel to itself.

The smooth simple shape of the fitting is  
 very suitable for being fitted with insulation.

By removing the U-shaped elbow, it is easy to  
 exchange single bars or to repair damaged  
 insulation.

A specific embodiment of the invention will  
 now be described by way of example with  
 reference to the accompanying drawing in  
 which:

Figure 1 shows a broken elevational view of  
 part of a stator winding embodying the inven-  
 tion; and

Figure 2 shows an end view of the winding  
 of Figure 1.

As shown in Figure 1, the stator winding is  
 composed of bars 3 formed from single con-  
 ductors some of which are hollow. A fitting  
 for electrically and hydraulically inter-connect-  
 ing a pair of these bars comprises two sleeves 1  
 and a U-shaped elbow 2. The sleeves 1 and  
 elbow 2 are formed from thickwalled seamless  
 tubes of good electrically conductive material,  
 for example electrolytic copper.

Each sleeve 1 is for a part 5 of its length  
 seated upon a cylindrical end 6 of the elbow  
 2, with a clearance 7 which permits the  
 brazing operation by which the sleeve 1 is  
 joined in liquid-tight fashion to the elbow 2.  
 The free end of each sleeve 1 is shaped to  
 provide a cavity 8 which, after the sleeves are  
 slid onto the non-insulated ends of the bars 3,  
 will accommodate the non-insulated ends of  
 the bars 3 with clearances 9 which are suffi-  
 cient to permit the formation of a liquid-tight  
 brazed joint between each sleeve 1 and bar 3.

In this embodiment, the elbow 2 has, on its  
 outer bend, a screw joint 4 for the admission  
 or discharge of the cooling liquid.

The straight parallel ends 6 of the elbow 2  
 facilitate the inter-connection of the bars 3  
 by the fitting when the fitting is assembled  
 on the bars, since said ends 6 are simply slid  
 into the parts 5 of the sleeves 1. This will  
 be possible, within limits, even if the sleeves  
 1, because of inaccuracies of manufacture, are  
 displaced longitudinally or transversely.  
 Figure 1 shows by means of broken lines 10

how longitudinal displacement of one elbow end 6 within its associated (upper) sleeve 1 during manufacture of the fitting compensated for corresponding displacement of the other 5 (lower) sleeve 1 along its associated bar 3 when the fitting and winding bars are assembled together. Figure 2 shows, by means of broken lines 11, how transverse displacement of one sleeve 1 when the fitting is 10 assembled on the winding bars can be made to compensate for transverse misalignment of the bars 3 which the fitting is intended to connect.

WHAT WE CLAIM IS:—

1. A rotating electrical machine stator 15 winding composed of insulated bar formed from single conductors some of which are hollow and provided with direct internal liquid cooling, the ends of a pair of said bars being electrically and hydraulically interconnected 20 by a fitting manufactured from a seamless thickwalled tube of circular cross-section of good electrically conductive material, the fitting comprising two sleeves and a U-shaped elbow

having substantially parallel cylindrical ends, which cylindrical ends are for a part of their length slid into said sleeves with a clearance required for brazing and are brazed liquid-tightly within said sleeves, the free ends of said sleeves being shaped in accordance with the bar ends received therein and dimensioned to accommodate said bar ends with a clearance required for brazing. 25

2. A winding as claimed in claim 1 wherein the elbow and the sleeves are manufactured from electrolytic copper. 30

3. A winding as claimed in claim 1 or claim 2, wherein the U-shaped elbow is provided, on its outer bend, with a screw joint for the admission or discharge of cooling liquid. 35

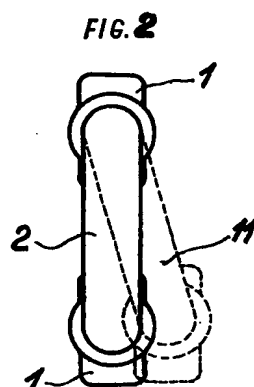
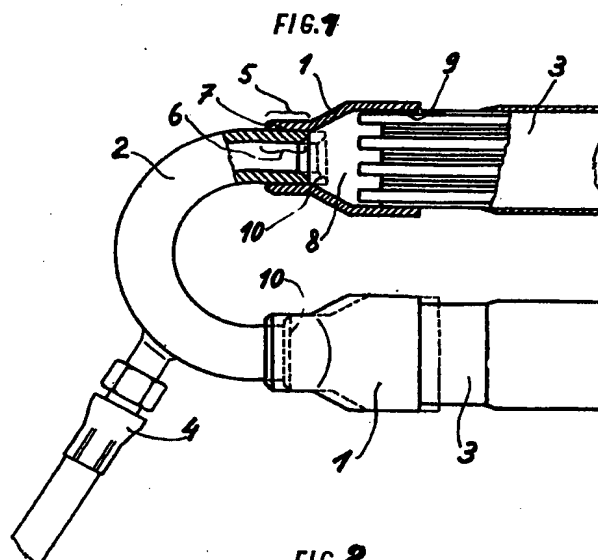
4. A winding substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing. 40

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**1 SHEET**

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